

MiniCAFS 2.1A

Operating Instructions

Model: MC50 with FoamLogix System



HALE PRODUCTS EUROPE

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IMPORTANT NOTES

Please read this manual before operating this equipment.

Every care has been taken during the manufacture of this equipment to ensure that it leaves the factory capable of giving a long period of trouble-free running.

SAFETY - RELEVANT DATA

Thank you for purchasing a MiniCAFS unit.

MiniCAFS is designed to give safe and reliable service – however, BEFORE operation it is essential that the Operating Instructions are carefully read and understood.

A risk-assessment of this equipment has been conducted with the following results:

MAINTENANCE

It is the responsibility of the user to ensure that the equipment is maintained in a safe operational condition, as per regulation 5 in the Provision and Use of Work Equipment Regulations 1998.

TRAINING

It is **ESSENTIAL** the MiniCAFS is operated **ONLY** by **TRAINED PERSONNEL**. Manufacturer's training can be obtained on application to Hale Products Europe Ltd., Charles Street, Warwick CV34 5LR, England.
Tel: +44 (0)1926 623600.

To avoid injury, the operators should take all necessary precautions to safeguard themselves and others and follow the operating procedures laid down in this book.

SAFETY POINTS

- DO NOT OPERATE the unit close to flammable materials or structures.
- DO NOT SMOKE while operating the unit
- Keep ALL UNTRAINED people AWAY from the unit during operation.
- PETROL IS EXTREMELY FLAMMABLE and MUST be HANDLED WITH CARE.
- DO NOT REFUEL until the engine is cold.
- DO NOT refuel whilst smoking or allow sparks or flames into the refuelling area.
- DO NOT OVERFILL the fuel tank. After refuelling, ENSURE that the fuel cap is refitted.
- Be careful NOT TO SPILL fuel.
- DO NOT run the engine in an enclosed area as poisonous gases are given off which can cause injury.
- DO NOT expose volatile fluids or battery gases to a naked flame.
- Avoid prolonged skin contact with fluids, especially if corrosive or carcinogenic.
- Protect the eyes as necessary.



The exhaust system becomes VERY HOT during operation and REMAINS HOT for a time AFTER the engine has been stopped. DO NOT TOUCH the exhaust whilst the engine is HOT.

The starting system is powered by battery. ALWAYS connect the battery positive (+ve) cable BEFORE the negative (-ve) and disconnect the negative BEFORE the positive.

- Disconnect the battery when working on the unit to avoid accidental starting.
- Batteries produce EXPLOSIVE GASES so do not expose to sources of heat and naked flames.
- DO NOT lift heavy weights without suitable assistance.
- DO NOT inhale fumes or gases.
- DO NOT remove protective guards or shields.

NOISE

When the unit is running, suitable EAR PROTECTION should be worn at all times by personnel.

MANUAL HANDLING

If the unit is to be removed from the appliance the design incorporates suitable lifting points.
The secondary starting method (hand-start) provided **MUST BE USED WITH CARE**.
Follow the operating instructions provided.

ENVIRONMENTAL PROTECTION

It is illegal to pour engine oil and other contaminants onto the ground, down sewers or drains, or into water courses.

Dispose of these through authorised waste disposal contractors to licensed waste disposal sites, or to the waste reclamation trade.

If in doubt, contact the Local Authority for advice on disposal facilities.

F.W. Mason
Managing Director

RECOMMENDED LUBRICANTS AND FUEL

ENGINE FUEL & LUBRICATING OIL

To API specification SF/CD	-30°C	-20°C	-15°C	-10°C	0°C	+30°C	+40°C
			SAE 5W/30				
				SAE 10W/30			
					SAE 10W/40 or 10W/50		
						SAE 15W/40 or 15W/50	
							SAE 20W/40 or 20W/50
	-22°F	-4°F	+5°F	+14°F	+32°F	+86°F	+104°F
PETROL		Lead free, minimum 85 octane. (Leaded may be used if lead free is unavailable)					

COMPRESSOR LUBRICATING OIL

Preferred:

Tamrotor F2105 Screw Compressor Oil or Screw compressor oil meeting ISO Viscosity grade 32 to 46.

Alternatively:

SAE 10W/40 automotive multigrade oil.

GENERAL DATA

ENGINE

Manufacture	Briggs & Stratton
Model	18HP Vanguard
Bore & Stroke	72.5mm x 70mm
Capacity	570 cc
Number of cylinders	2 cyl vee
Number of main bearings	2
Lubrication Pressurised	Full Flow System
Service Oil Fill Capacity	1.7 litres
Oil filter	'Spin On' disposable canister
Fuel feed	Vacuum Pulse Pump
Fuel tank capacity	8.5 litres
Battery	12v/14A

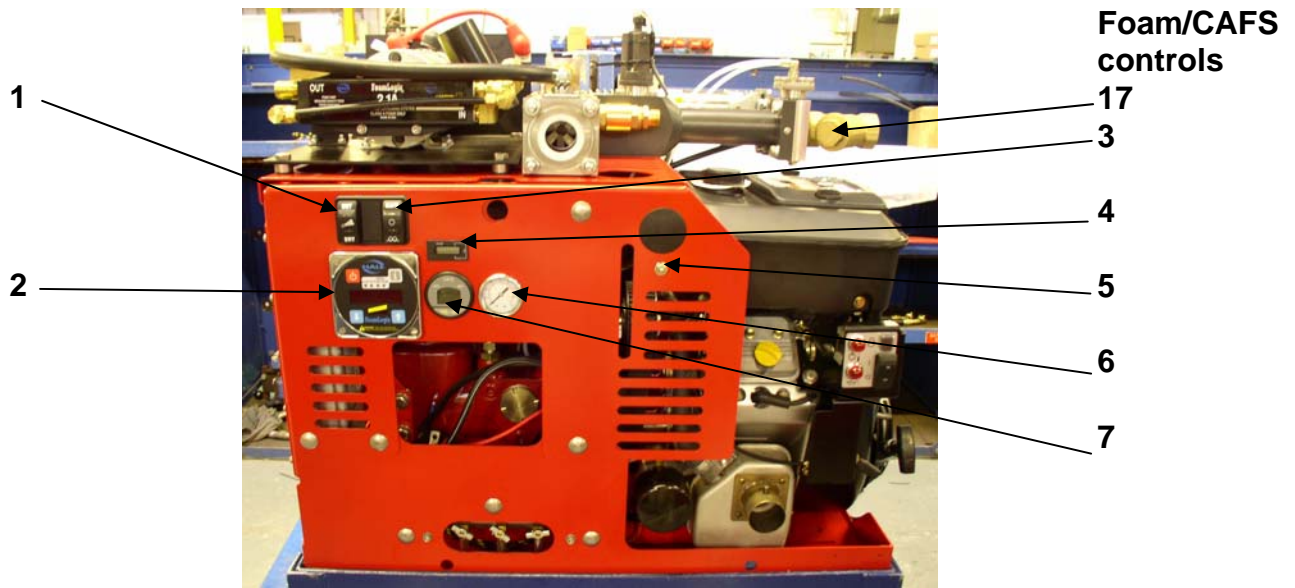
COMPRESSOR

Model	HSC50
Maximum Operating Speed	7250 rpm
Nominal speed of operation	6250 rpm
Nominal power draw	12.0kW
Direction of rotation (when looking on pulley)	Anti-clockwise
Oil volume (approximate)	3.5 litres

FOAM PROPORTIONING SYSTEM

Manufacturer	Hale Products Inc
Model	Foamlogix 2.1A
Type	Electronic Foam Proportioning system
Operating voltage	12 volts
Current draw	20 amp
Max. Foam Agent Flowrate	8.0 L/Min

INSTRUMENTS and CONTROLS



INSTRUMENTS

1. WET or DRY foam selector

2. FoamLogix display and control

3. CAFS or Foam selector

4. Hours run counter

5. Air dump valve

6. Air pressure gauge

7. Wet or Dry foam indicator

COMMENTS

Press top to make foam wetter
Press bottom to make foam dryer

See page 16 for details

Press top for CAFS, press bottom for foam only

Records total number of hours engine has been running

Rapid relief of compressor pressure to aid cold starting

Indicates air injection pressure

Indicates wet or dry composition of foam

ENGINE CONTROLS

8. High compressor oil temperature

9. Engine choke control

10. Starter switch

11. Ignition switch

12. Low engine oil pressure

13. Fuel shut-off

14. Fuse

15. Back-up Starting

16. Charging socket

17. Water supply filter

Red light

Pull out fully when starting engine from cold
Gradually return the choke when engine is running smoothly

Press in to start engine

Press top to switch on ignition,
press bottom to switch off

Red light

Turn Anti-clockwise to open

10 amp fuse

Recoil starter device

For battery charging only. A fuse (item 14) is included to prevent its use for jump starting

Remove filter for cleaning

INTRODUCTION

The MiniCAFS is a Compressed Air Foam System comprising of three major components – air compressor (driven by air-cooled engine), FoamLogix (foam proportioning unit) and manifold (foam mixing and control system). All the components are in one integrated module designed to fit in the standard envelope of a DIN 8kVA generator.

Water is supplied from the main pump at a pressures between of 4-10 bar, depending on requirements or operator preference, and fed, via non-return valves, into a manifold assembly where flowrate is measured and a metered amount of foam is injected. This foam/water solution is then fed through an air control valve (ARC) at which wet or dry foam is selected (air ratio control section of manifold). Compressed air is then injected and the resulting foam/water/air solution is thoroughly mixed (X-mixers) before being fed to a discharge connection.

The unit is provided with several safety interlocks to ensure that: -

1. Foam cannot be injected unless water is flowing through the unit.
2. Air cannot be injected unless foam and water are flowing through the unit. This prevents “slugging” in the discharge line caused by air and water, which cannot mix
3. A low level switch in the foam tank will stop air injection when the tank is empty to prevent slugging.

Compressor

The rotary twin-screw compressor provides 50 scfm of compressed air at 7 bar and is driven by an 18hp air-cooled petrol engine, running generally at a constant speed. The engine has its own built in 8.5 litre fuel tank, which is sufficient for in excess of one hours running. The oil in the rotary air compressor is cooled by water taken from the vehicle main pump via the water supply line. To ensure adequate cooling water must be supplied to the unit prior to starting the engine. A return line delivers the cooling water back to the vehicle tank. Alternatively, the water can be run to drain, but this is not recommended.

If the unit is run from a closed tank the water will gradually heat up and at an increasing rate as the volume of water reduces.

NOTE: The compressor should never be run without the pump providing a water supply for cooling.

The compressor will reject approx. 8.0 kW of heat energy to cooling, and the installer must consider this additional thermal load

A blowdown valve is fitted to the compressor to remove any constrained pressure in the system when the compressor is stopped.

FoamLogix

The FoamLogix 2.1 foam proportioning system consists of three main components:

- 1) Foam Pump / Motor Assembly, mounted on top of the unit.
- 2) Control Panel, mounted on the side of the unit.
- 3) Flow measurement and injection manifold, mounted on top of the unit.

All three parts work together to provide accurate and reliable foam proportioning. From the control panel, the operator can turn the system on, adjust the foam injection percentage, read real time water flowrate and record total water and foam usage.

The FoamLogix system is powered up when the engine is started. Foam agent is only injected when the red **ON** control button is depressed

Hale FoamLogix foam proportioning systems are completely engineered; factory matched foam-proportioning systems that provide reliable, consistent foam concentrate injection for Class A foam operations. Hale FoamLogix systems accurately deliver from 0.1% to 9.9% foam concentrate directly into the water discharge stream. It is then fed as foam to the mixing chamber and discharge piping.

Manifold

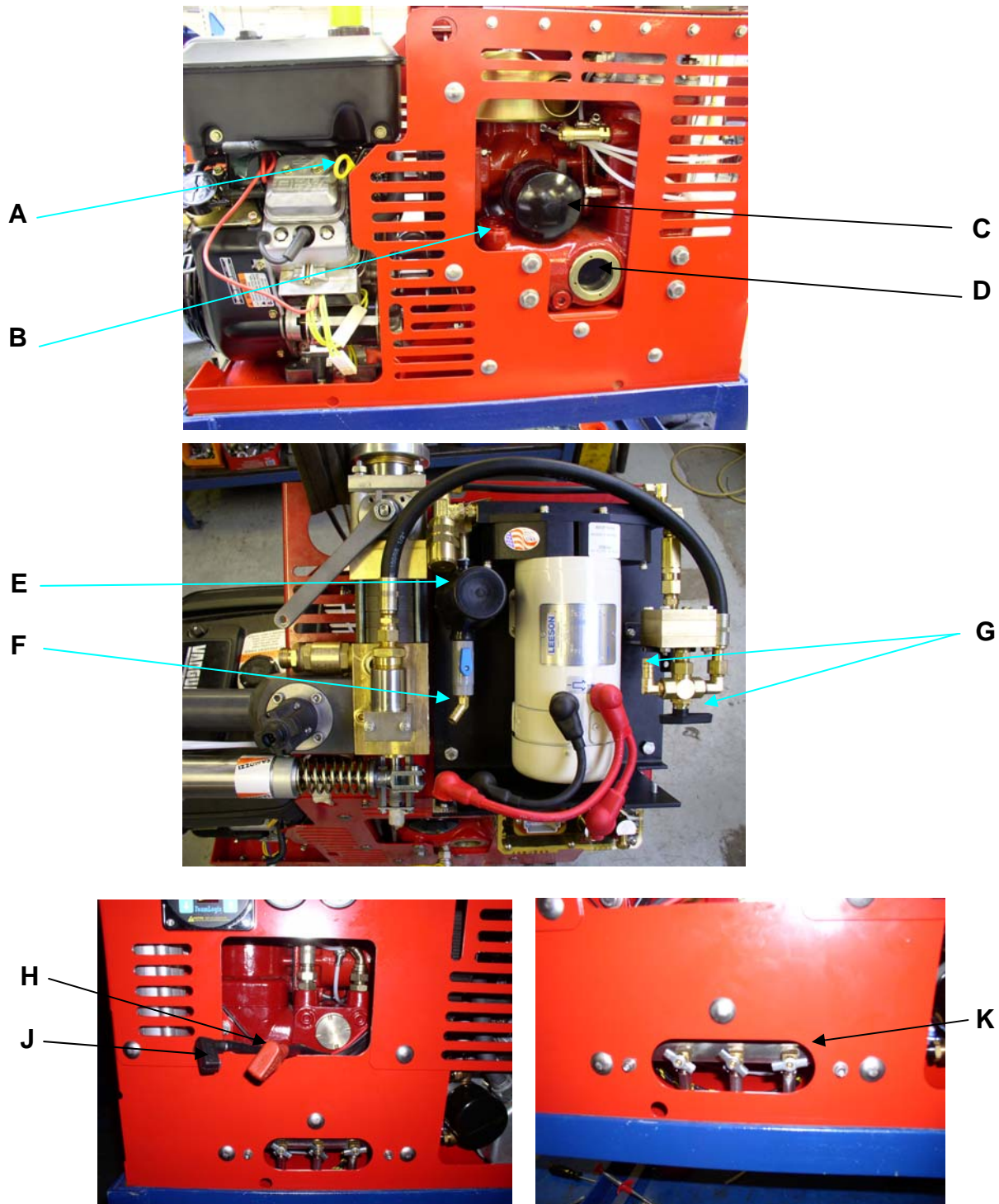
The manifold incorporates an air ratio control valve at which varying wet or dry foam mixtures can be selected. Compressed air is then injected and the resulting foam/water/air mixture is mixed by passing through the X-mixer section before being fed to a discharge connection.

CAFS units are best suited for use with Fresh Water. For compatibility of foams in salt water conditions advice should be sought from the foam agent manufacturers.

The unit is provided with several drain taps located at the bottom of the frame that can be opened to drain water from the manifold and compressor cooling system. This should be done whenever the unit is not intended to be used for a prolonged period (1 week+).

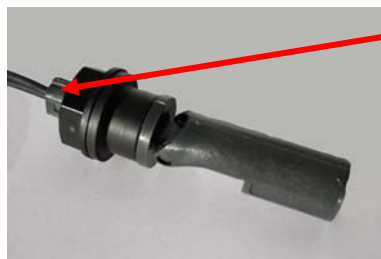
INSTALLATION

Caution: MiniCAFS is shipped without oil in the Compressor or Engine.
Oil **MUST** be added before the unit is started.
All connections are labelled and must be secured before starting the unit.



1. If the unit is installed in the side locker of a fire fighting vehicle, provision must be made for access to the engine oil dipstick **(A)**, compressor oil-fill **(B)** and sight glass **(D)**, all located on the rear side of the MiniCAFS. The drive motor is air-cooled, and cooling air must be allowed to flow unhindered into and out of the unit. Avoid any enclosing cladding at a distance of approx. 300mm around the engine cooling air intake. Compressor oil filter is item **(C)**.
2. The cooling line **(L)** from the heat exchanger should return to the top of the vehicle water tank using ϕ 13 min. diameter flexible hose. There must be no kinks or obstructions in this line.
3. The preferred method of supplying foam agent is from an on board foam tank. This **MUST** be mounted to give a head of foam agent to the FoamLogix pump. The Low-level switch (Supplied) **must** be installed so that the circuit becomes **closed** when the foam tank is empty. Connect the low-level switch connection on the foam tank to the Interlock wiring harness **(M)** on the MiniCAFS, using the extension harness provided.

Note: the low foam level switch must be installed in the tank in the correct orientation. The switch device has a raised marker on the casing where the wires enter the device. This marker must be installed at the 12 o'clock (top) position for correct functioning. The foam tank requires a 23mm hole for secure fitting of the switch device and the maximum allowable thickness of tank wall material is 4mm. The switch device should be installed at a location in the tank wall that allows for activation when there are approximately 3 litres of foam left before running out.



This marker must be at 12 o'clock (top) when the switch device is installed

Connection (M) for low foam level switch



(L) Compressor cooling return line, inside panel

4. Connect the foam agent supply to the inlet connection on the FoamLogix pump **(F)**, situated on top of the unit. Note the location of the By-pass valve and connection point **(G)** and the foam filter **(E)**.

Note. Connections must be secure and pressure tight if the FoamLogix pump is to operate correctly.

CAFS or foam discharges here



Water supply of between 4-10 bar connected to here.

5. Connect a water supply of 4-10 bar pressure from the main pump to the inlet connection on the MiniCAFS manifold. This should be of $\phi 50$, flexible, non-kinking hose. An isolating valve must be provided between the vehicle pump and the MiniCAFS unit to prevent the unit being pressurised when not being used.
6. Fill the engine with engine oil & fuel as per the Briggs & Stratton manual.
7. Fill the compressor with the correct grade of oil until the sight glass is 3/4 full.
8. Remove the battery, fill with electrolyte, fully charge to 12 volts and reconnect. Note the battery connection leads, positive (+) is the red lead **(H)**, the negative (-) the black lead **(I)**,
9. The exhaust silencer of the MiniCAFS unit is provided with a DIN socket for an exhaust extension hose. With the aid of such a hose, the exhaust gases can be conducted out of the body of the vehicle and led away from the unit.

Caution: Pressurised water must be supplied to the unit any time the engine is run and must be circulating before the engine is switched on.

Caution: The exhaust extension and the exhaust gases are very hot.

10. Following the Briggs & Stratton operator's manual (attached at back of manual), start the engine and run for 30 seconds to circulate the oil.

Note: The engine has an electric start button located above the rocker ignition switch and a recoil rope back-up starter for manual operation.

11. If the engine should stall after starting (especially from cold) it may be necessary to relieve the pressure in the compressor by pressing the air dump valve (5, Page 7).
12. Shut the unit down and allow the oil to settle for 5 minutes.
13. Add additional oil as necessary to the engine to keep the oil level between the Max. and Min. marks on the dipstick.
14. Add additional oil as necessary to the compressor to keep the oil at least 3/4 full in the sight glass.
15. Note the location of the drain taps **(K)** for draining the system of water after use and before storage, this is particularly necessary if freezing weather is expected.

The unit is now ready for commissioning of the foam proportioning and CAFS system.

COMMISSIONING/ START-UP PROCEDURE

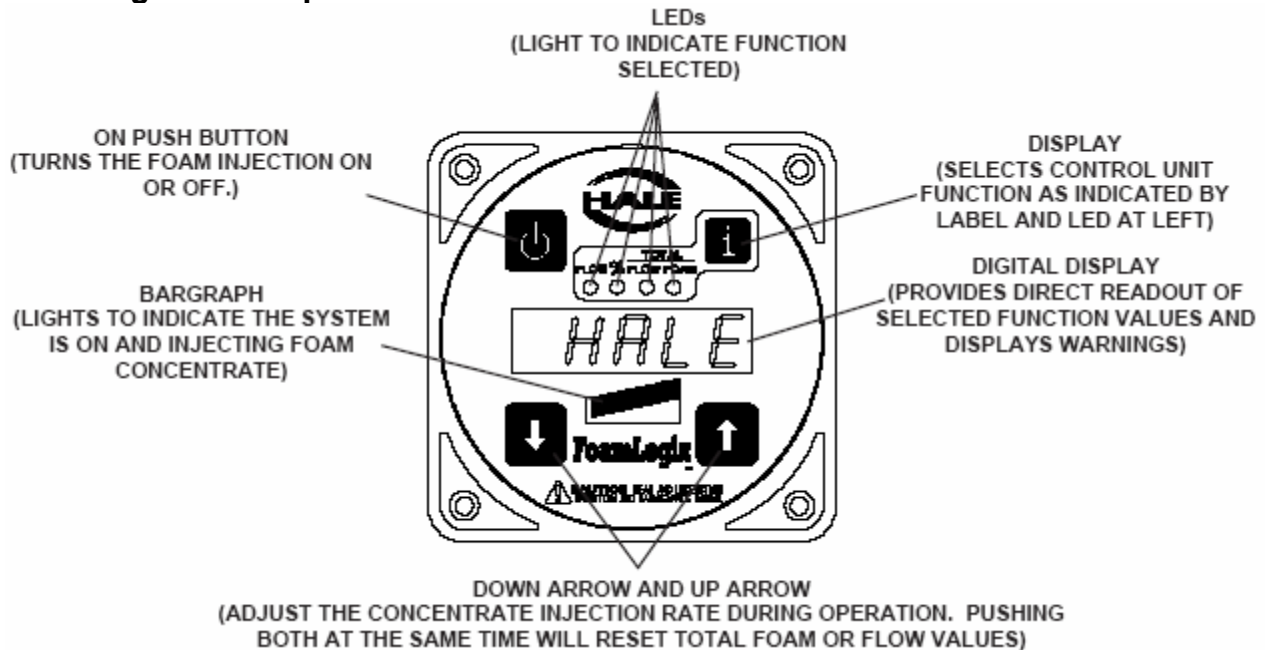
Caution: The heat exchanger return flow is over 40 l/min. This flow must not be restricted.

Caution: The unit should be run in open air with any compartment doors open and the containment drawer ideally pulled out to improve ambient airflow.

1. Follow the installation procedure in the previous section.
2. Supply the MiniCAFS with water at a pressure of 4-10 BAR.
3. Make sure that an adequate foam supply is available (i.e. foam tank is full).
4. Connect a suitable delivery hose and branch to the MiniCAFS discharge.
φ38 to φ45mm diameter layflat hose is suitable for delivering CAFS. If a single discharge is being used, a φ25 to φ38mm smooth bore nozzle would be suitable. If two delivery hoses are to be deployed, then two φ19 nozzles would be appropriate.

Note: The engine should be run at full speed. The compressor pressure and load is changed but the engine throttle will remain in the fast position.

FoamLogix control panel functions -



Check that all the necessary connections have been made as described in the previous sections

1. Run the compressor for 30 seconds to allow oil to circulate. Press the CAFS switch (3, P8) on the instrument section.
2. Stop the unit and check compressor oil level – top up if necessary.
3. Turn the bypass valve on the FoamLogix pump to bypass (arrow points to left) and provide a suitable receptacle to collect the foam, agent (**G, P11**).
4. Ensure that there is sufficient foam agent in the tank.
5. Select simulated flow on the FoamLogix by pressing both up ↑ & down ↓ at the same time.
6. Press the red **on** button, and the pump will prime itself. The pump will run for 30 seconds or until prime is achieved. If no prime is made, the display will show “**no pri**”. Repeat this step once more to attempt to prime the pump.

"no Pr" = No prime display



7. When prime is achieved, deselect simulated flow by pressing both up ↑ & down ↓ at the same time.
8. Return the bypass valve to the inject position (arrow points to right).

The unit is now ready to run.

OPERATING MiniCAFS FROM A VEHICLE WATER SOURCE

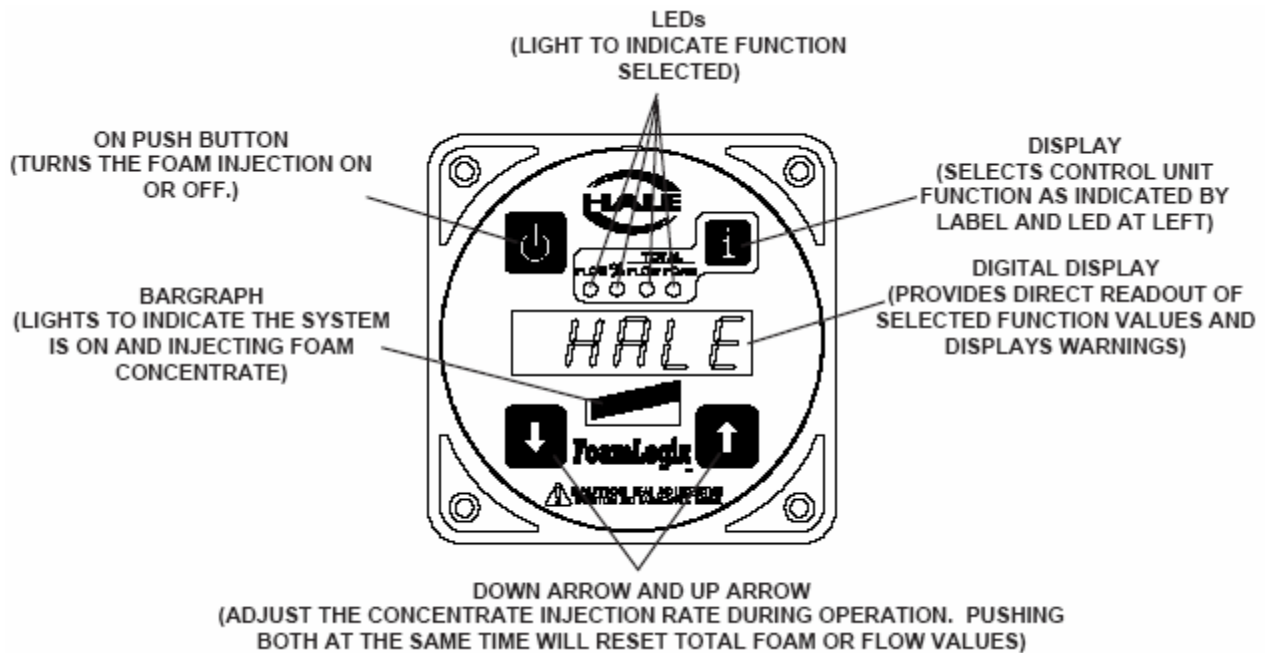
1. Connect a suitable delivery hose and branch to the CAFS discharge. $\phi 38$ to $\phi 45$ mm diameter layflat hose is suitable for delivering compressed air foam. If a single discharge is being used, a $\phi 25$ to $\phi 38$ mm smooth bore nozzle would be suitable. If two delivery hoses were to be deployed, then two $\phi 19$ nozzles would be appropriate.

Note: The best foam quality is produced using a smooth bore nozzle with the foam going through the minimum number of valves and sharp bends. However, the scrubbing action of the foam on the hose wall tends to improve the foam quality.

Note: A standard fog nozzle can be used with CAFS if used on the 'Flush' setting. Using the 'Fog' settings will severely degrade the foam quality.


Note: the following controls on the FoamLogix Control Panel -

FoamLogix Control Panel

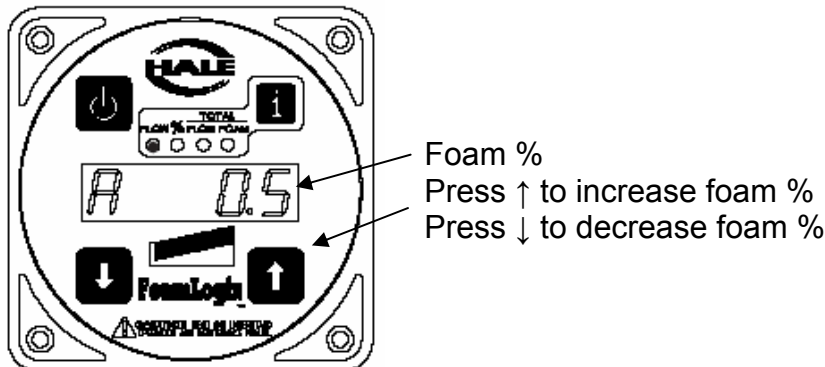


1. Discharging foam agent only

1.1. Set water feed from supply pump at required pressure

1.2. Ensure that the foam only option is selected by pressing the bottom of the Foam/CAFS selector switch, marked with the symbol -  (No.3, Page 7)

1.3. Press the red **on** button, and choose desired foam % setting. (Default is 0.5%)



1.4. Open CAFS discharge valve to deliver foam agent.

Note: the WET/DRY control (ARC valve) is only operable when CAFS is selected. The control will default to the wet condition when CAFS is turned off.

2. Discharging CAFS

2.1. Select CAFS by pressing the top of the CAFS selector switch – marked “CAFS” (No.3 Page 7)

2.2. Ensure that engine throttle on MiniCAFS is fully open

2.3. Open CAFS discharge valve to deliver foam agent.

Wet Foam or Dry Foam

- 2.4. A continuously variable foam type from WET to DRY is available, selectable by the pump operator.
- 2.5. The WET or DRY foam composition is selected by using the WET/DRY control on the panel (No.1 Page 7). An indication of foam type is given by the WET or DRY foam indicator (No.7 Page 7), but the pump operator may choose to optimise the liquid flow as displayed in the FoamLogix display.
- 2.6. To increase the WET or DRY property of the foam, press the WET/DRY control (No.1) at the top for WET or the bottom for DRY.
- 2.7. Note: when discharging dry foam at low pump pressure, the possibility of hose kinking is increased and should be considered when deploying hoses on the fire ground.
Note: the WET/DRY value will always default to wet when the compressor is stopped.

Shutting Down

- 2.8. Set WET/DRY selector switch to the WET foam setting (Press in **bottom** of switch)
- 2.9. Turn off the FoamLogix, press RED button.
- 2.10. Run water through the CAFS discharge system to flush out the foam agent.
- 2.11. Close the CAFS discharge valves
- 2.12. Switch off the engine.
- 2.13. If cold weather is expected, open the drain taps (**K, Page 12**) to drain the CAFS manifold.

Overheat Shut down

If the compressor is running hot, a warning indicator light will illuminate on the control panel when oil temperature reaches 105°C.

If the compressor oil temperature exceeds 110° C, the unit will shut down automatically. The compressor can sustain 105°C temperatures for short periods without damage. The unit can be re-started when the compressor has cooled.

The most likely cause of compressor overheat problems is insufficient cooling water flow. Verify that the cooling water return line is not kinked or restricted before running again. Cooling water flow is approximately 40l/min minimum.

Note: The system is designed to allow the air pressure to decay slowly which reduces the tendency of the oil to froth when releasing the entrained air.

TO OPERATE FROM A REMOTE FOAM SUPPLY

Foam agent can be inducted out of conventional commercial canisters. The base of the canisters must be above the FoamLogix Pump and the MiniCAFS. A suitable dip tube should be manufactured for the suction line. The bypass pipe should be fed back into the foam canister.

Note The FoamLogix must be re-primed each time the foam canister is changed.

Note The system will not have the protection of a low foam level switch, and if the foam supply is exhausted, air may be drawn into the FoamLogix Pump, and “Slugflow” may result.

BATTERY CHARGING

A battery charging plug is included on the unit and a fuse (**14, 16, page 7**) rated at 10 Amps is installed between this connector and the battery to prevent jump-starting a dead battery through this connection.

MAINTENANCE

Weekly:

- Check the oil levels and top up if necessary.
- Check the belt tension/condition and adjust if necessary.
- Check the hose connections.
- Check battery charge.

Every 50 hours or every 3 months

- Check and clean the water supply filter (M, Page 12) for debris

Every 100 hours or every 6 months (whichever comes first):

- Change the engine oil and filter. B&S oil filter P/N 4929325
- Change compressor oil and filter. Filter P/N 59271/01
- Clean the Foam filter.

Annually or every 400 hours:

- Change the air cleaners (engine & compressor).
- Engine Air Filter – part number 57799
- Compressor Air Filter – part number 59271

Every Two Years

- Change drive belt - part number 59062

Note: Both the drive belt and the air cleaners may have to be changed more often in dusty/dirty/heavy duty applications.

EFFECT	CAUSE	ACTION
Compressor overheats	No water supply or restricted flow	Turn on water supply. Check oil cooler pipe work for obstructions
Unable to produce foam solution	FoamLogix not operating	Switch on engine ignition Switch on FoamLogix
	No Foam in tank	Refill with foam agent
No air injection	CAFS switch not on	Turn CAFS switch on
	Low foam switch activated (If fitted)	Refill foam Tank
Air and liquid not mixing (Slugflow)	Depleted foam supply (Low level switch not fitted)	Refill foam tank
	Foam % set too low	Increase foam % setting
Surging of hose and pressure gauge.	Insufficient air pressure in hose	Increase compressor speed if not at maximum.
		Reduce nozzle diameter.



RECOMMENDED FOAM AGENTS

Class A Foam	Manufacturer	Brand name
US Forestry Service Approved	ANSUL	Silvex Class A Foam Concentrate
	Angus	Forexpan S (0.1% - 1.0%)
	Chubb National Foam	1 st Defense Class A Coldwater Foam
	Chubb National Foam	Knock-Down
	Monsanto	Phoscheck WD881
	Chemonics	Fire-Trol Fire Foam 103
	Chemonics	Fire-Trol Fire Foam 104
	3M	Light Water FT-1150
Non U.S. Forestry Service Approved	ChemGuard	Class A Plus
	Unifoam Co Ltd.	UniA 1%
	3M	Light Water SFFF

RECOMMENDED SPARES

FOR 2 YEARS OPERATION

ITEM	PART No	QTY	DESCRIPTION	COMMENTS
ENGINE GROUP				
1	(B&S) 4929235	4	OIL FILTER	
2	57799	2	AIR FILTER	
3		2	SPARK PLUGS	CHAMPION RC12YC
4	THM10998	1	O-RING	UNDER OIL COOLER BODY
5	57807	2	O-RING	OIL FILTER ADAPTER
COMPRESSOR GROUP				
1	59271/01	4	OIL FILTER	
2	59271	2	AIR FILTER	
3	59062	1	DRIVE BELT	
4	UFP2303/8	2	DOWTY WASHER	DRAIN PLUGS AND OIL LINES